

Fiber-Based Electro-Optic Field-Mapping System

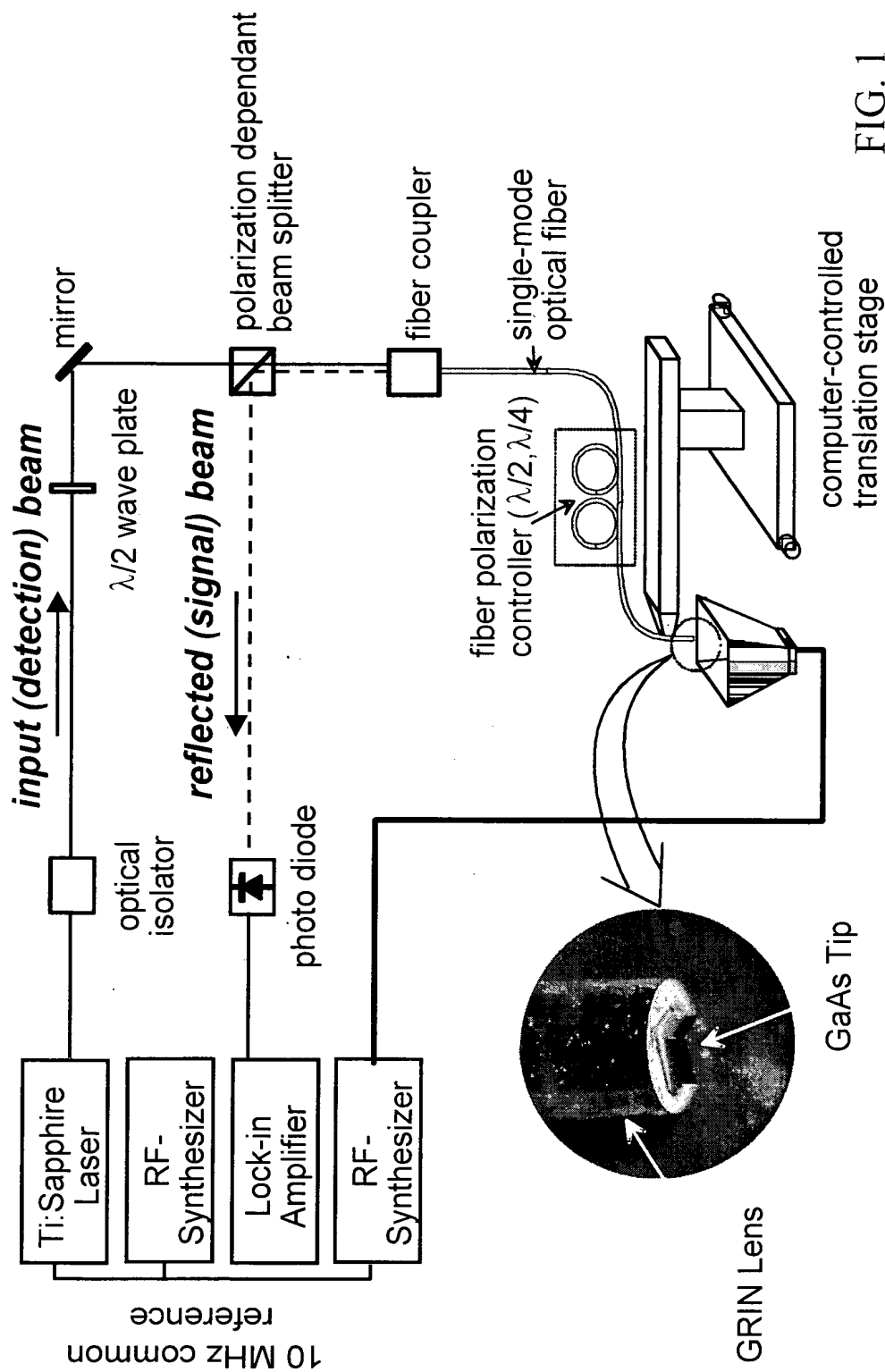


FIG. 1

Fiber-Based Electro-Optic Field-Mapping System Polarization Control

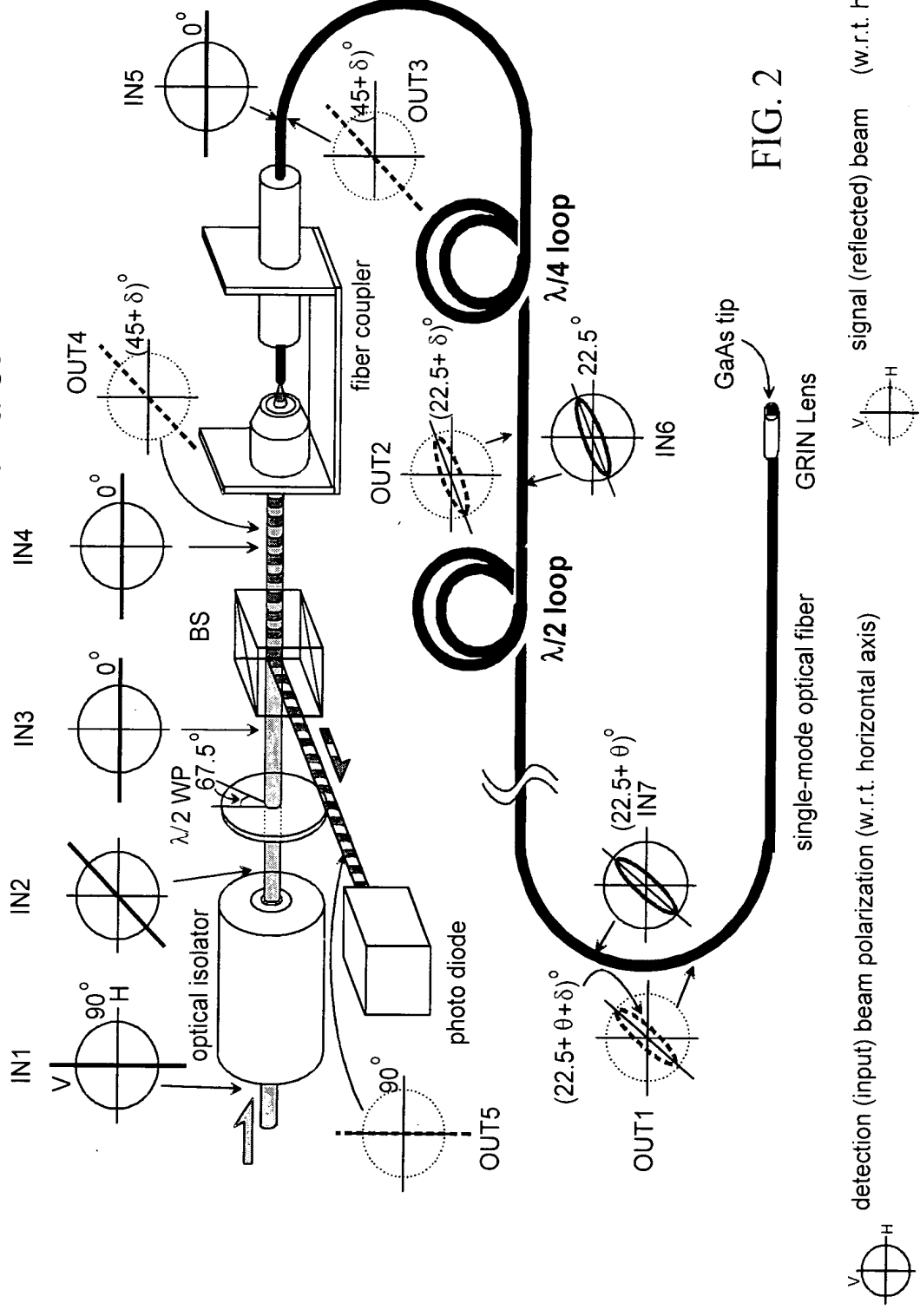


FIG. 2

Fiber-Based Electro-Optic Sampling System GRIN Lens

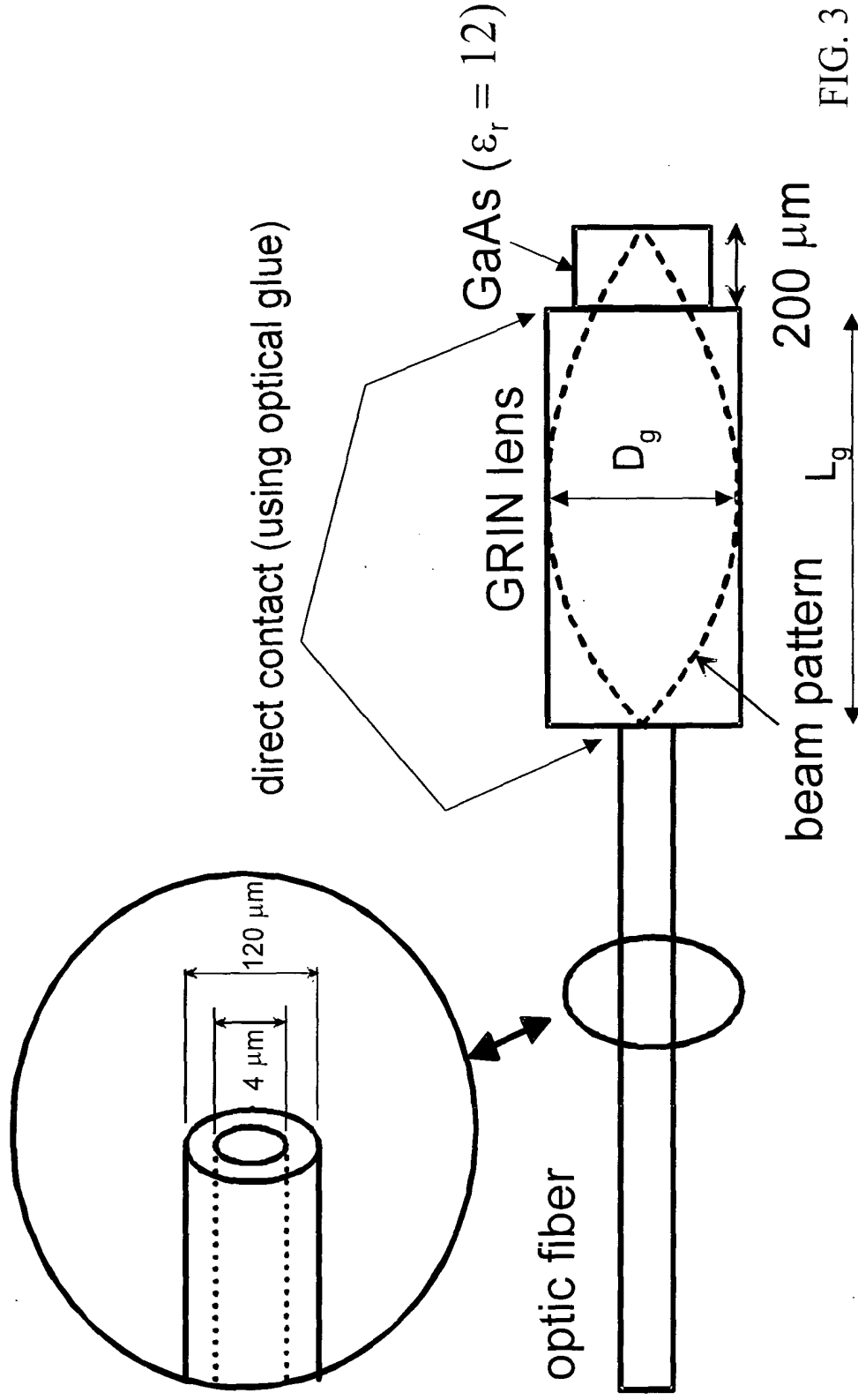
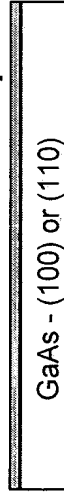
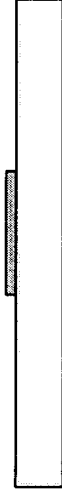


FIG. 3

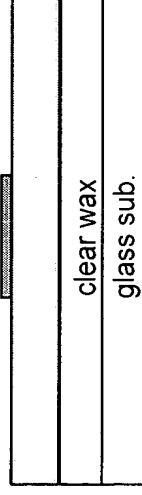
Fiber-Based Electro-Optic Sampling System Probe Tip Fabrication Procedure



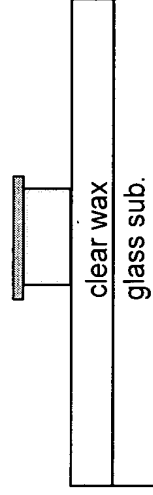
PR 1827 : 3.5 Krpm (30 sec), 105 C (1 min)



PR 1827 : expose (15 sec), develop (50 sec),
hard bake (105 C°, 1 min)



mount sample on glass substrate
using clear wax (on the 150 C^o hot plate)

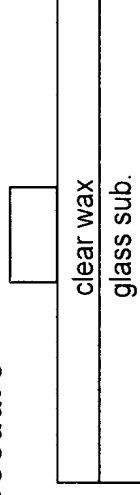


wet etching : $\text{H}_2\text{SO}_4 : \text{H}_2\text{O}_2 : \text{H}_2\text{O}$

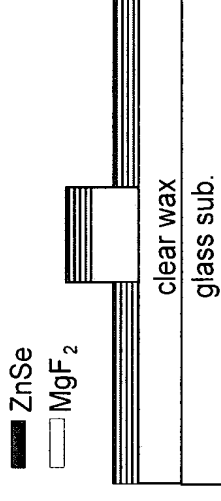
$$= 1 : 8 : 1$$
+ few drops of NH_4OH

agitate 30 sec every 30 sec

change etchant every 10 min.



expose without mask (15 sec), develop (90 sec)



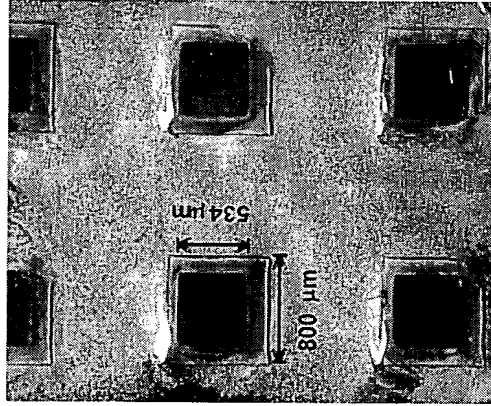
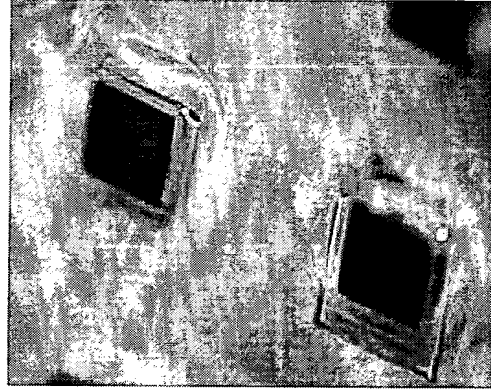
Distributed Bragg Reflector (DBR) deposition

$$\text{MgF}_2 = 1,403 \text{ \AA}, \text{ZnSe} = 833 \text{ \AA} \times 4 \text{ sets}$$


Final probe tip
(released in the hot acetone)

FIG. 4

Fiber-Based Electro-Optic Sampling System **Probe Tip Fabrication - (100) GaAs**



etching depth ~ 160 μm (7.95 μm/min x 20 min)
 (lateral : 130~150 μm, 6.5~7.5 μm/min)

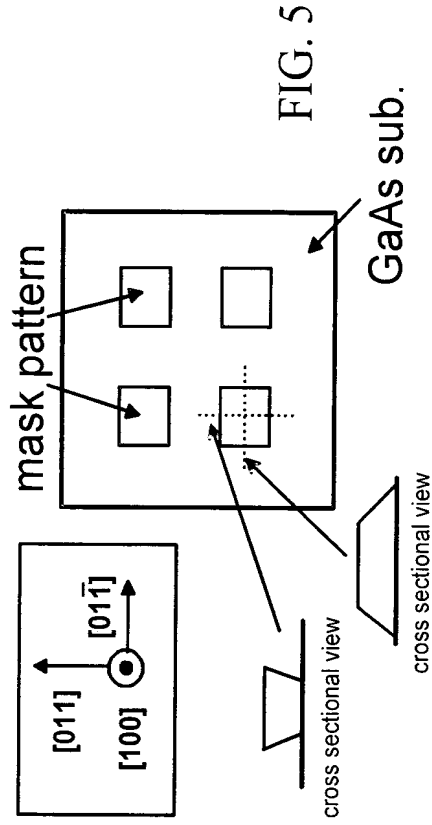
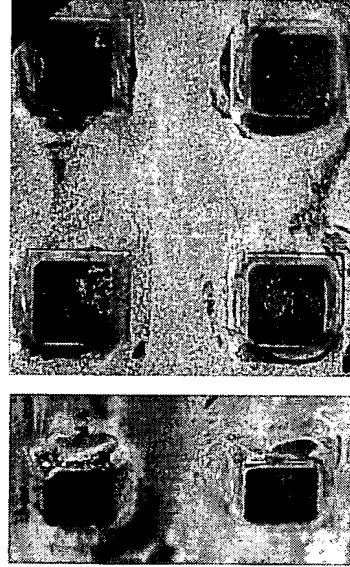
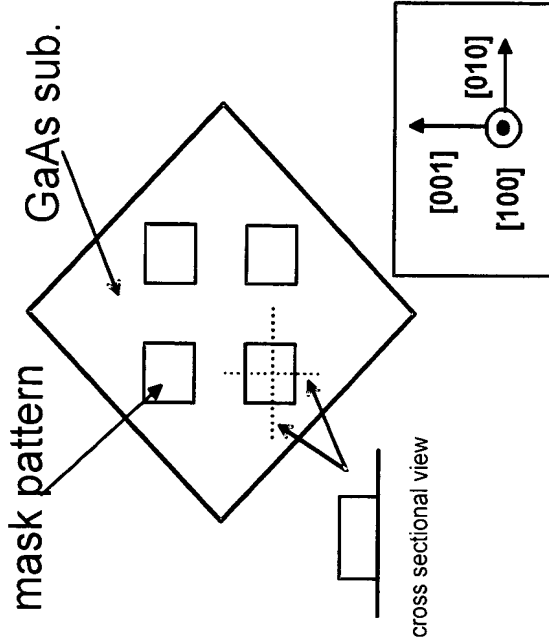
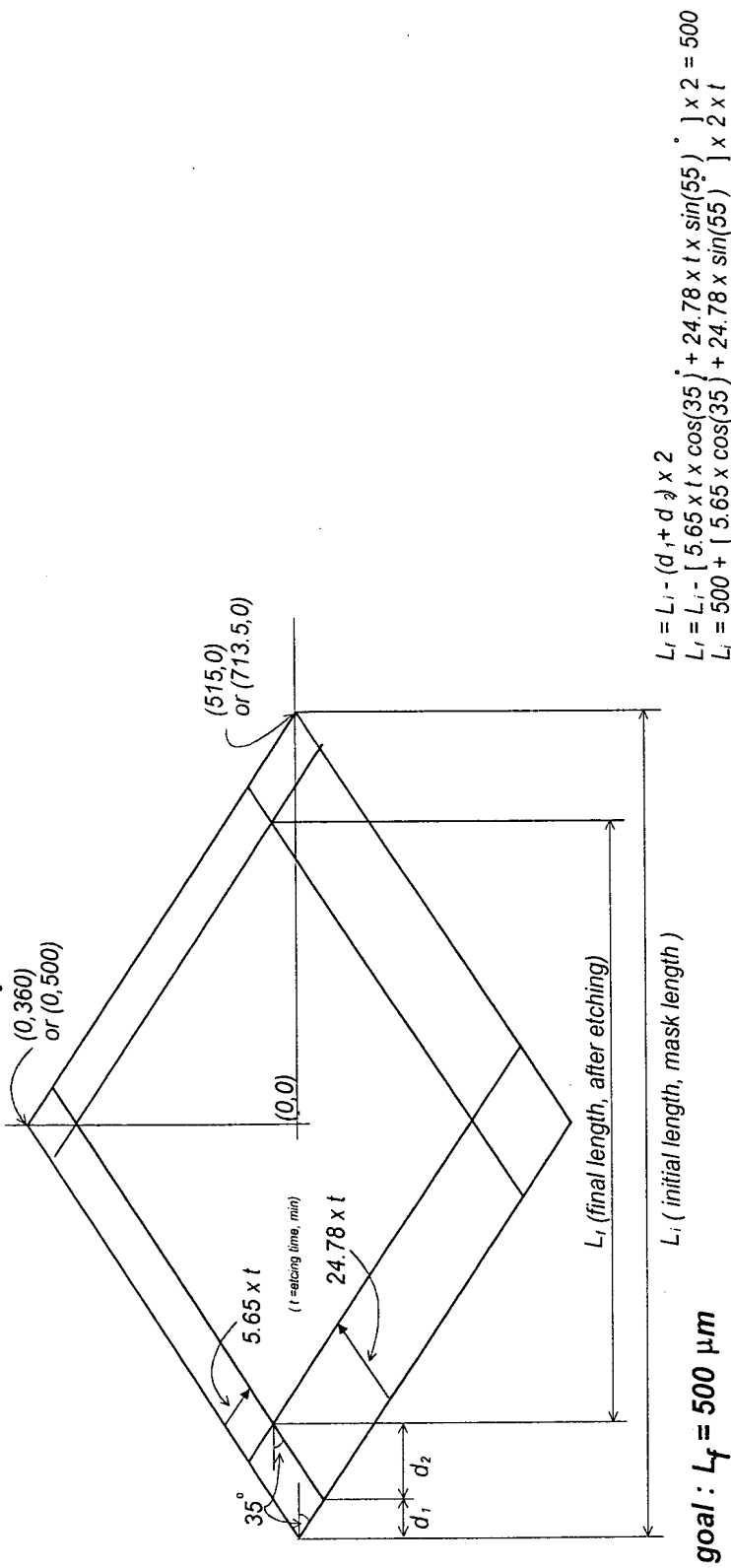


FIG. 5

Fiber-Based Electro-Optic Sampling System Probe Tip Fabrication - (110) GaAs



where,
 $t = 200 / 18.86 (\mu m/min) = 10.6 \text{ min for } 200 \mu m \text{ wafer}$
 $t = 350 / 18.86 (\mu m/min) = 18.6 \text{ min for } 350 \mu m \text{ wafer}$
 (t = etching time, min)

$L_i = 1029 \mu m \text{ for } 200 \mu m \text{ wafer,}$
 $= 1427 \mu m \text{ for } 350 \mu m \text{ wafer}$

FIG. 7

Fiber-Based Electro-Optic Sampling System Probe Head Assembly

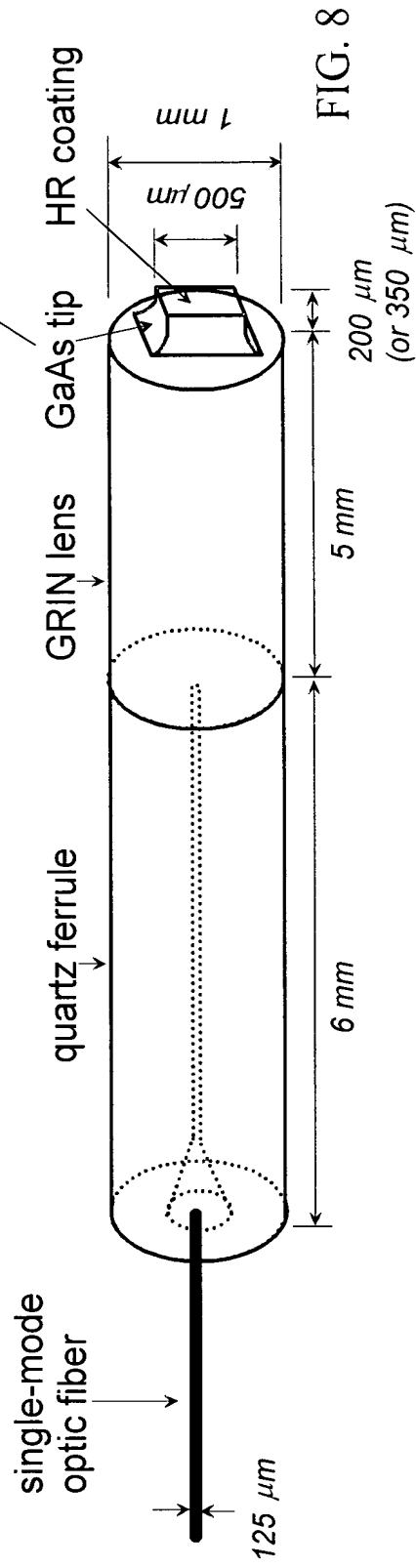
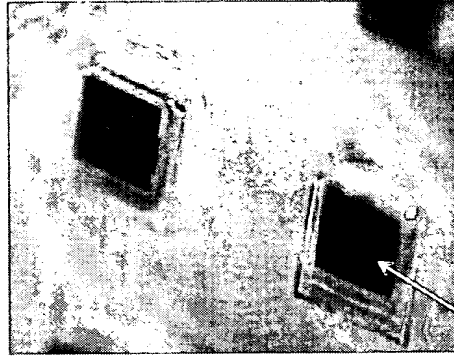


FIG. 8

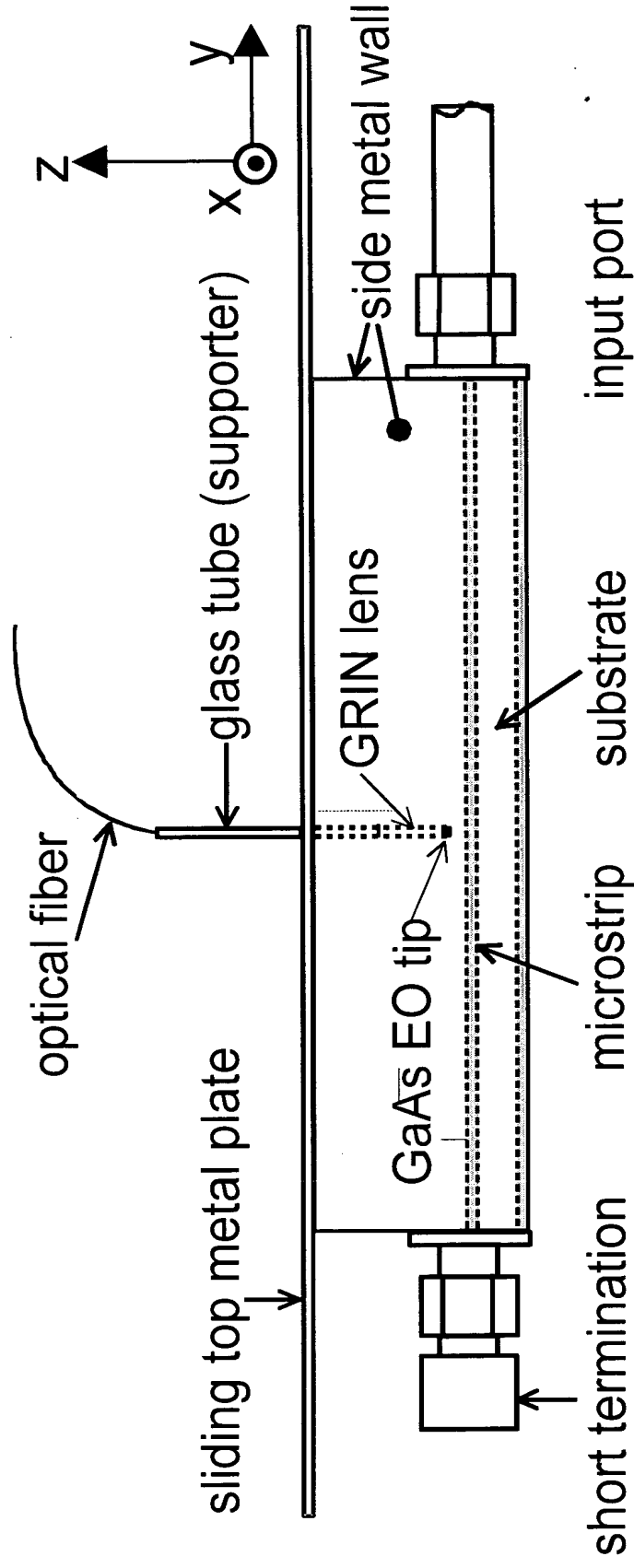


FIG. 9

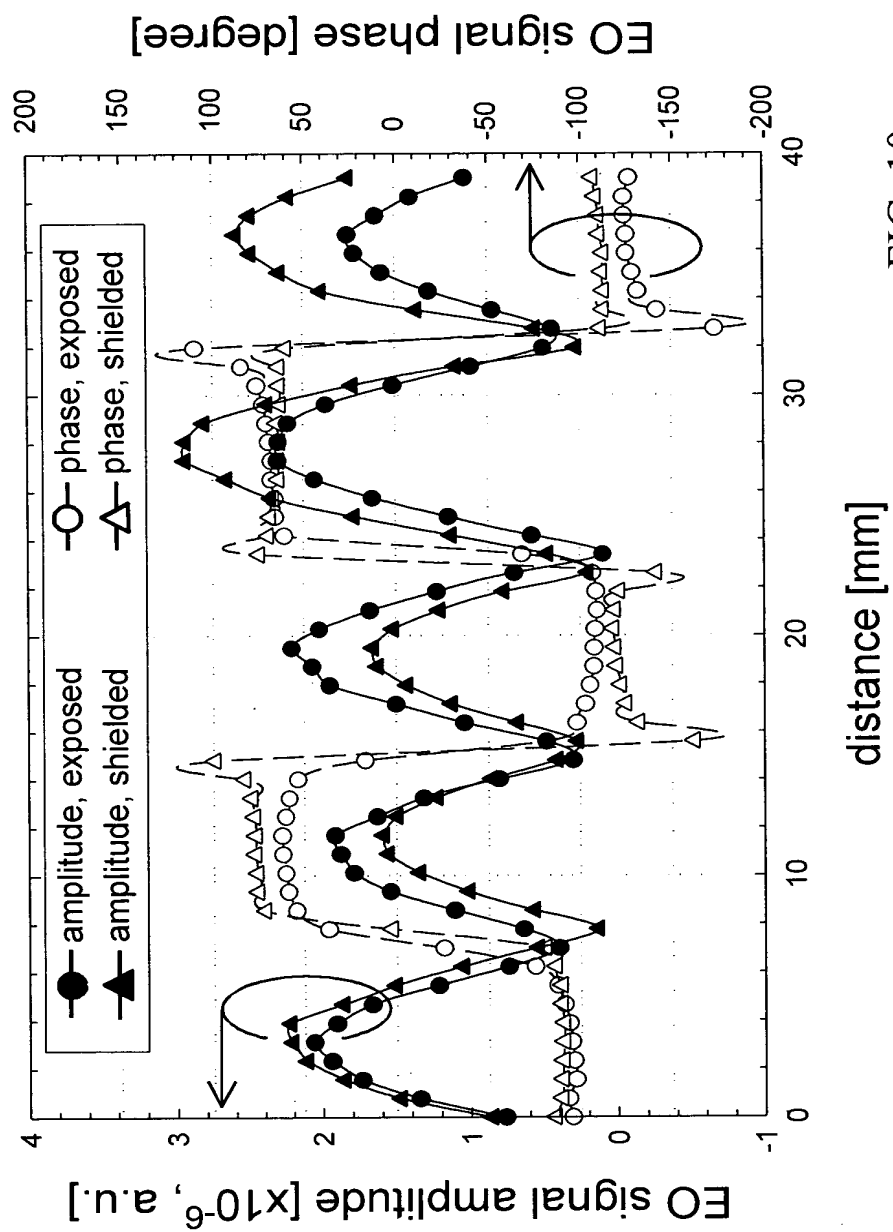


FIG. 10

10

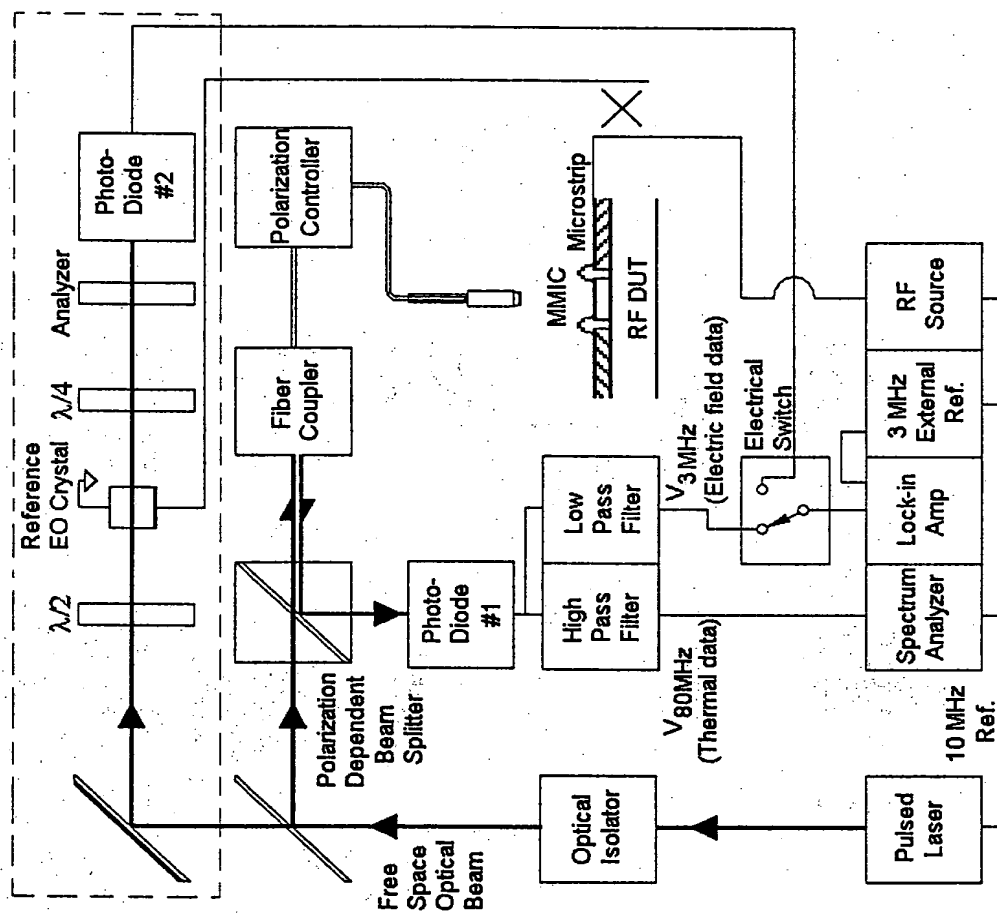


Fig 11

10092157-03000

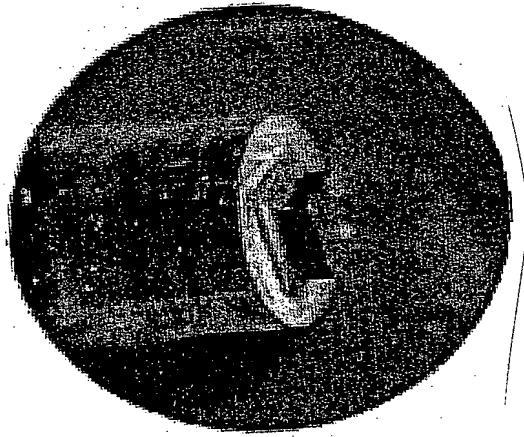


Fig 12

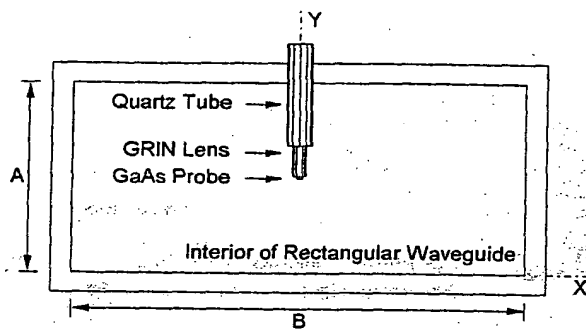


FIG 13

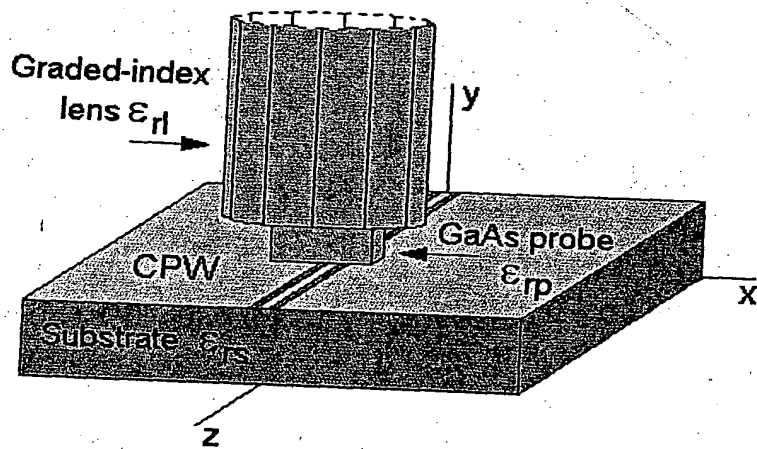
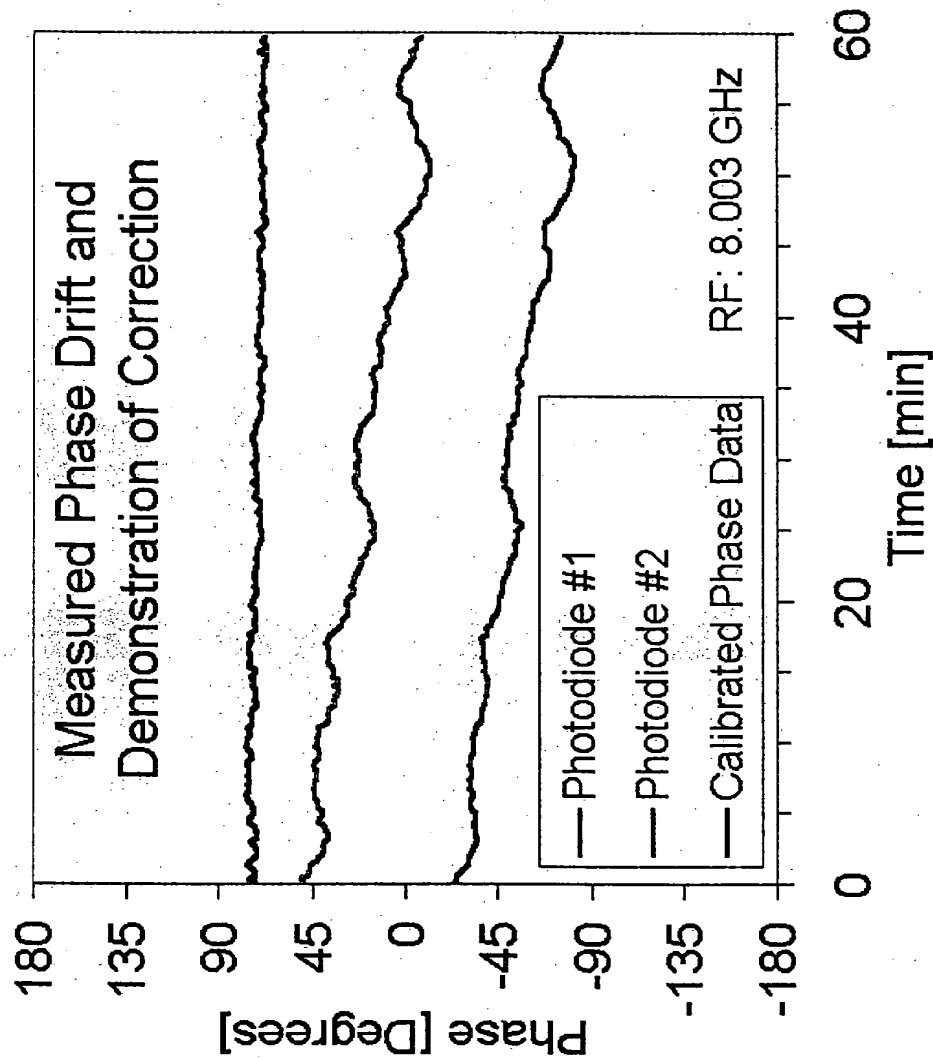


FIG 14

Characterization - Electric Field Phase



• Over one hour, measured temporal phase stability is $\pm 3^\circ$.

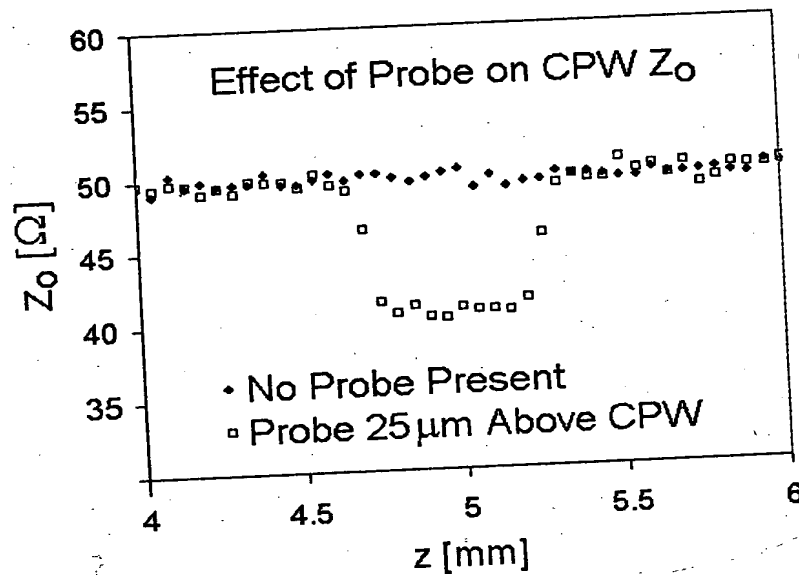
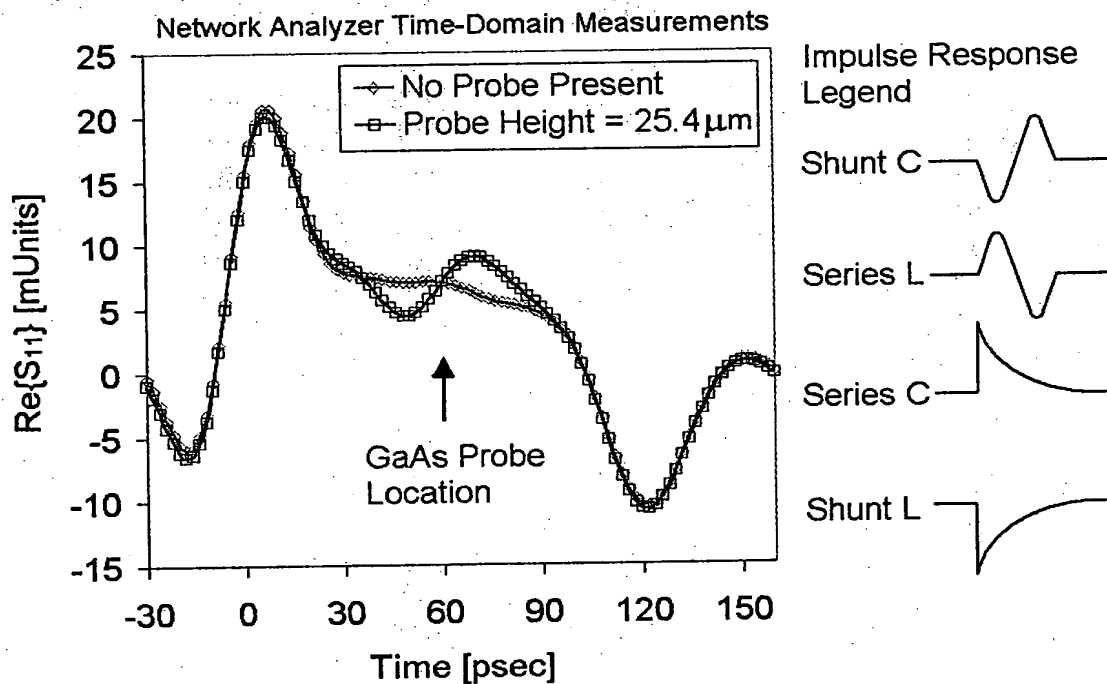
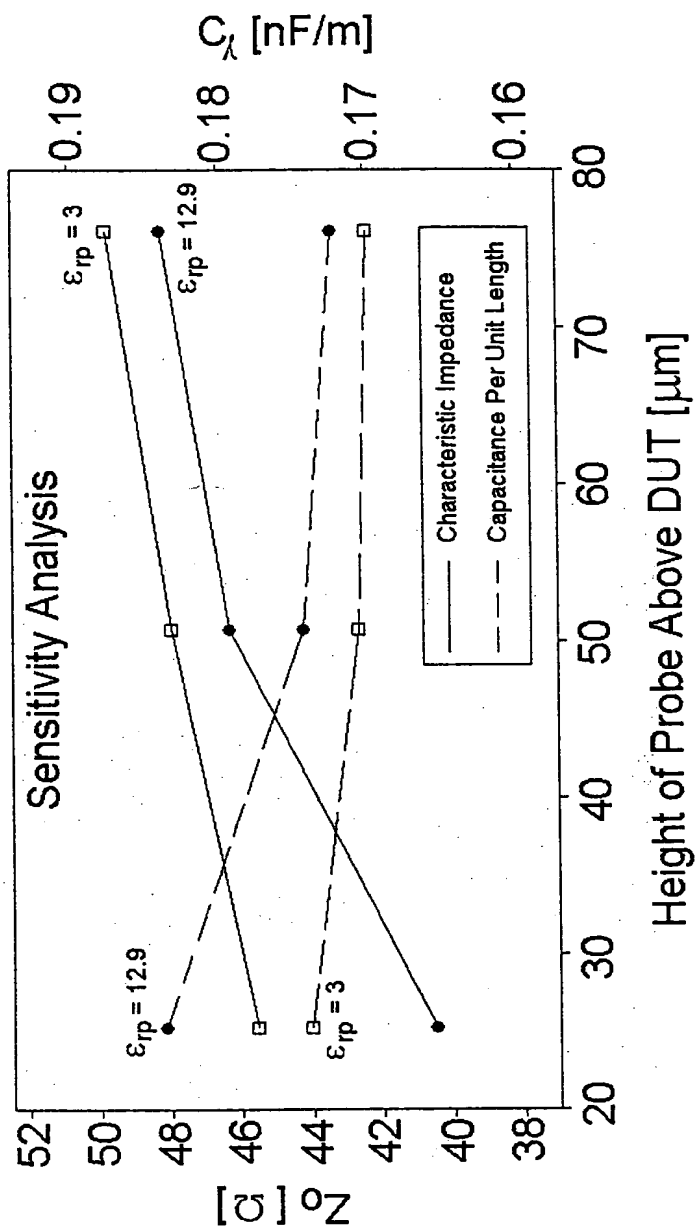


FIG 16



Frequency domain measurements (2 - 40 GHz):
 $|S_{11}| < -30$ dB with and without probe.

FIG 17



• Effect of probe is equivalent to a lumped shunt capacitance on the order of femtofarads.

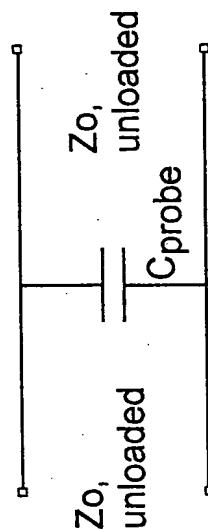


Fig 18

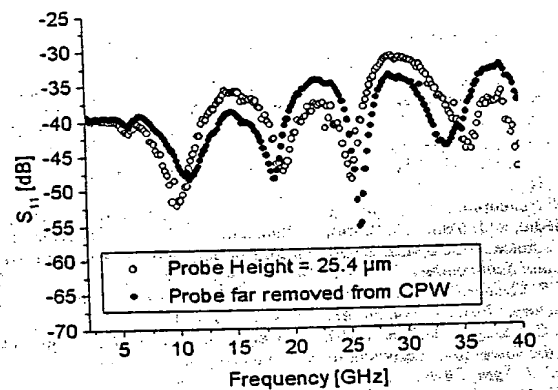


FIG 19

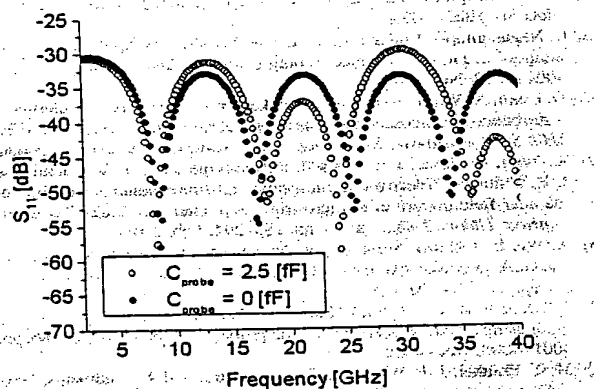


FIG 20

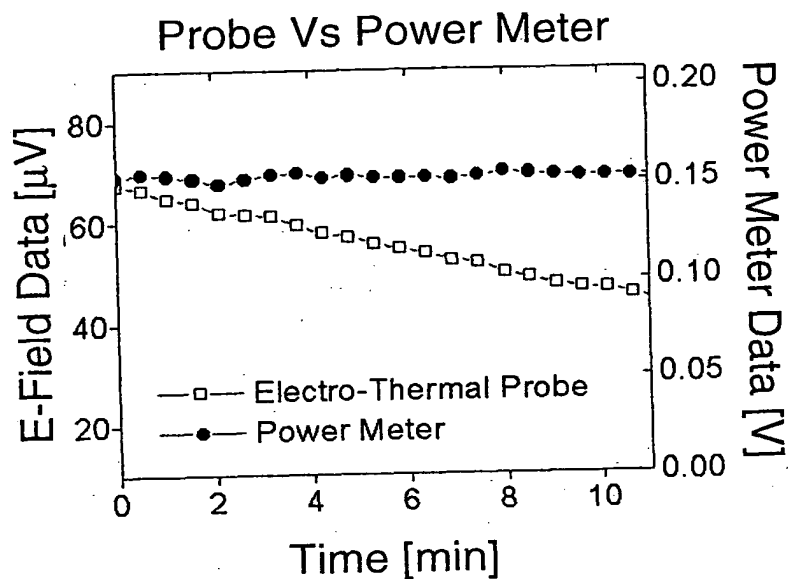


FIG 21

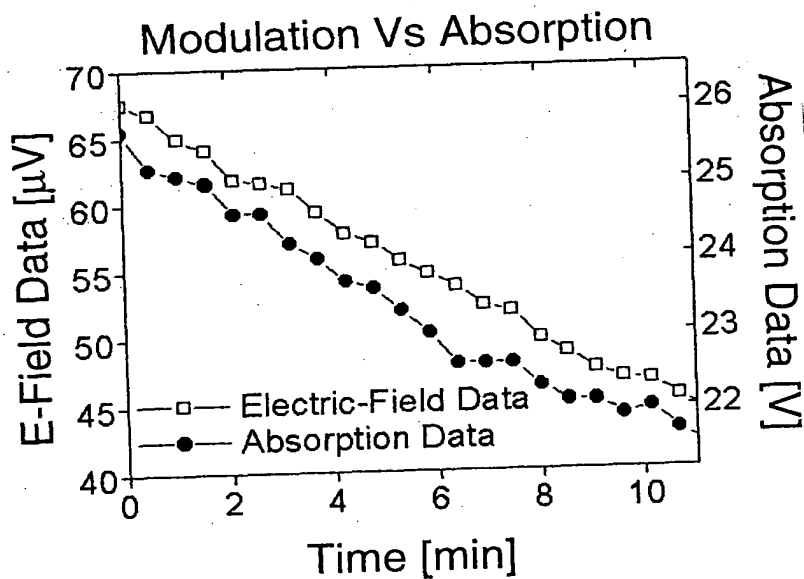


FIG 22

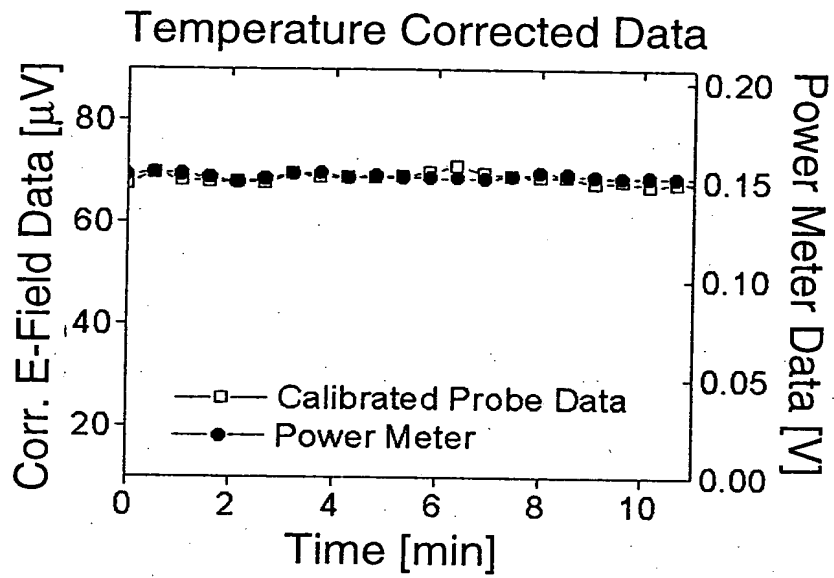


FIG 23

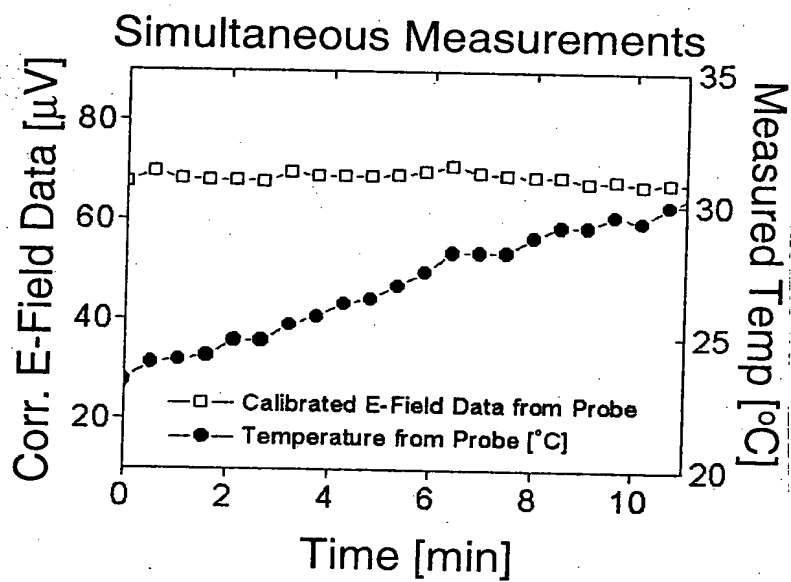


FIG 24